

NEWSLETTER

GEOLOGICAL SOCIETY
OF
NEW ZEALAND



No. 18

JULY 1965

REPORT OF THE STRATIGRAPHIC CODE SUBCOMMITTEE.

NEWSLETTER

GEOLOGICAL SOCIETY OF NEW ZEALAND

Member Body of the Royal Society of New Zealand

No.18

July 1965

This issue of the Newsletter of the Geological Society of New Zealand is devoted to (1) the report of the Subcommittee to investigate the desirability of a New Zealand stratigraphic code, and

(2) the results of the questionnaire on stratigraphic nomenclature.

The Subcommittee (Mr N. de B. Hornibrook (Chairman), Mr B.W. Collins, Dr Maxwell Gage, Dr David Kear, Dr Paul Vella and Dr J.B. Waterhouse) was appointed by the Committee of the Geological Society at a meeting held at Takaka in May 1964 (see Newsletter No.16, pp.4-5). It later circulated a detailed questionnaire with the July 1964 issue of the Newsletter, and the results of this are given on pp.9-27 of this issue in the form of an appendix to the main report of the Subcommittee (pp.1-8).

REPORT OF THE SUBCOMMITTEE TO INVESTIGATE THE DESIRABILITY OF A NEW ZEALAND STRATIGRAPHIC CODE.

Terms of reference: To report on (1) The desire for and desirability of New Zealand adopting a stratigraphic code; (2) Suggestions made to it for changes in the particular existing code the Subcommittee thinks the best; (3) The likelihood of general support for any such suggested changes, and (4) The desirability of and means of enforcing a code in New Zealand.

INTRODUCTION

Existing Codes

Three stratigraphic codes are widely used overseas; (a) The Statement of Principles of Stratigraphic Classification and Terminology by the International Subcommittee on Stratigraphic Terminology, issued in the Report of the 21st Session of the International Geological Congress in Copenhagen, 1961 XXV: 7-38; (b) The Code of Stratigraphic Nomenclature, approved by the American Commission on Stratigraphic Nomenclature 1961, Bull. Amer. Ass. Petr. Geol. 45(5): 645-665; (c) The Australian Code of Stratigraphic Nomenclature, 4th Ed. J. Geol. Soc. Aust. 11: 165-171, 1964.

The preamble of the American Code reads (in part) "The Articles of this code are recommendations that cannot be generally mandatory, but geological organizations may adopt these articles as their rules of nomenclatorial procedure."

The preamble to the Australian Code reads (in part); "Geologists who make surveys leading to the use of new stratigraphic names should refer the names and definitions of the proposed units to the Convenor of the Divisional Stratigraphic Nomenclature Sub-committee....."

The Purpose of Stratigraphic Codes is Twofold:

(a) To provide a guide to stratigraphic classification and a common framework and heirachy of stratigraphical units and a uniform nomenclature for them. Its function is to ensure that when particular classifications are used in a consistent manner with the same meanings, rather

than to provide a set of rules as to how all stratigraphic situations must be classified.

Some aspects of stratigraphical classification remain controversial and no statement of principles has been formulated that satisfies all stratigraphers. Would not an attempt to impose a set of principles, even though they were approved by the majority of geologists, on the remainder be contrary to the spirit of geology which owes much of its progress and vitality to a vigorous and unorthodox minority?

(b) To define mandatory and non-philosophical rules of classification such as the form and derivation of names, rules of priority and minimum requirements in describing new stratigraphic units to provide stability of nomenclature.

The present situation in New Zealand:

No particular stratigraphic code is officially adhered to by either the Geological Survey or the Universities and only about half of the New Zealand geologists questioned regularly consult a particular code.

Nevertheless, in recent years New Zealand stratigraphers have kept more or less in line with the usage recommended by the International Geological Congresses, particularly in lithostratigraphic and time-stratigraphic terminology.

The major divisions of stratigraphic classification in use in N.Z. are the same as those of the International Code; the most common problem is to achieve consistency in applying the units of classification. Few N.Z. geologists would now confuse the usage of "Series" with "Group" but many might disagree as to whether a particular unit should be classified as a group, formation or bed.

There is not a great gulf of opinion separating the majority of N.Z. geologists from others who have adopted one of the three main stratigraphic codes.

Questionnaire on Stratigraphic Nomenclature

With the July 1964 issue of the Newsletter, the Sub-

committee distributed a questionnaire based on the Statement of Principles in the International Code. From results which appear in the following part of this Newsletter, the following conclusions have been reached:

(1) The majority of N.Z. geologists favour an attempt to standardize principles and methods of classification and the meanings of terms but only a small minority favour a formal mandatory code. It is clear that any attempt to impose a formal code of rules would meet firm resistance. Most consider that authors should be free to depart from any code or set of recommendations provided they state clearly how their usage differs.

(2) About half New Zealand geologists now use an existing code; more use the American Code than any other.

(3) The extent of agreement on many questions such as the function and desirability of type sections and the separation of bio- and time-stratigraphy were unknown to the Subcommittee until the questionnaires were returned. The answers indicated that the majority of N.Z. geologists are in general agreement with the statement of principles contained in the I.C. and that there is wider agreement on many questions than could have been expected. Vigorous opposition to the I.C. on controversial issues was expressed mainly by an articulate minority.

(4) There is fairly general agreement on the separation of classification into Lithostratigraphy, Time-Stratigraphy, Biostratigraphy and Geological Time.

(5) The I.C. lithostratigraphic classification is accepted by most except for "lithostratigraphic zone".

(6) The form of nomenclature of lithostratigraphic units required by the I.C. is considered too rigid by many N.Z. geologists who would prefer an option as to whether "Formation" "Member" and "Bed" or alternatively the characteristic lithology should be included in the formal names. A majority considers it acceptable to use other than geographic names for formations members and beds but most specify "in areas with insufficient geographic names".

(7) The use of "Group" for both vertically and

laterally contiguous formations is favoured by most.

(8) Most agree with the practice of designating type sections and many favour additional standard sections.

(9) The statement, in the Australian Code, that igneous and metamorphic rocks should be classified and named according to the same principles as sedimentary rocks as far as possible, received almost total approval. However, detailed comments on the problems of ash shower stratigraphy suggested that this subject may require special consideration.

(10) Answers to the section on biostratigraphic classification indicate considerable disagreement. There was also criticism of the lack of precision in the I.C. definitions of zones and there is opposition to type sections for "assemblage zones". It is doubtful whether there is sufficient unanimity among N.Z. geologists at present to reach general agreement on alternative definitions.

(11) Most N.Z. geologists and paleontologists accept the principle inherent in the I.C. and American Codes that zones can be of any magnitude and are not necessarily restricted to units of lesser rank than a stage according to the usage of Arkell.

(12) Most consider that time stratigraphy and biostratigraphy are different categories of classification and should be kept separate.

(13) The I.C. classification of time-stratigraphic terms is acceptable to the majority except for "Erathem".

(14) The I.C. definition of stage is accepted by most geologists and paleontologists but a few expressed vigorous opposition to both the I.C. concept and definition, particularly to the words "rocks formed during a specific interval of geologic time".

(15) The majority accept the practice of basing a stage on a type section but many stress the value of additional standard sections. In this respect the wording

of the I.C. definition which states that stages should be defined by "type or reference sections" is unsatisfactory and would be better changed to "type and standard" sections to agree with New Zealand practice.

(16) Although nearly all favour "-an" endings for stages most do not favour "-an" endings for series as recommended by the I.C.

(17) Most geologists accept the I.C. statement, that some stages may have only certain parts designated as sub-stages, but most paleontologists do not.

(18) "Chronostratigraphic zone", adopted by the I.C. as an informal unit is not regarded by most N.Z. geologists as a useful term.

(19) Nearly all object to duplication of the name of rock units and series or stages.

(20) Nearly all accept the I.C. classification of units of geologic time except for the term "time" as the equivalent of substage. Many prefer 'subage'.

(21) The results, taken at face value appear to show that most N.Z. geologists and paleontologists would be prepared to follow the International Code as a general guide to classification and nomenclature providing the wording of some definitions is emended and more latitude is given in the form of lithostratigraphic names.

CONCLUSIONS

The answers to the questionnaire that have been summarised above allow the following conclusions regarding the four points of the subcommittee's terms of reference:

- (1) The desire for and desirability of New Zealand adopting a Stratigraphic code.

Whereas only a small number of N.Z. geologists favour a formal mandatory code, the majority favour an attempt to standardise principles, methods of classification, and meanings of terms. It must be concluded that such standardisation is very widely desired and is therefore desirable.

- (2) Suggestions made to the Subcommittee for changes in the existing code it thinks the best.

The Subcommittee does not offer an opinion on the value of various codes because its members hold as diverse opinions on stratigraphic classification as does any other group of N.Z. geologists although it does note that the American and I.C. codes provide a more comprehensive statement of general principles and nomenclature than does the Australian code. The replies to the questionnaire suggested that a modified version of either the International or American Code would be acceptable to those members of the Society who desire a code. The American Code is too detailed, however, to be introduced initially. The final conclusions (5 below) include the changes and additions to the International Code that appear desirable.

- (3) The likelihood of general support for any such changes.

It appears likely that the changes listed below (5) would have general support.

- (4) The desirability of and means of enforcing a code in New Zealand.

A substantial majority of N.Z. geologists are not in favour of enforcing a mandatory code in N.Z. Most feel that with a non-mandatory code, authors should state how and why they have not complied with it.

(5) The results of the questionnaire suggest that the following proposals might find widespread acceptance among members of the Geological Society. The Subcommittee therefore recommends that they be put before members for discussion.

(a) That the Geological Society of N.Z. recommends the Statement of Principles of Stratigraphic Classification and Terminology, by the International Subcommission on Stratigraphic Terminology, 21st International Geological Congress 1961, as a non-mandatory guide to stratigraphic classification, subject to the following amendments and additions:

- (1) The inclusion of the words "Member" "Formation" and "Bed" or alternatively the dominant lithology,

combined with a geographic name shall be optional in the nomenclature of lithostratigraphic units.

(2) The use of non-geographic names for formations members and beds is allowable but primarily for areas with insufficient geographic names.

(3) In the I.C. definitions of "Formation" and "Stage" the words "based on a specifically designated and delimited type section or reference sections" should be amended to read "based on a specifically designated and delimited type section with or without standard sections."

(4) Group and Supergroup may include both vertically and laterally contiguous formations.

(b) That in proposing new stratigraphic names, rock and stage names are not to be duplicated.

(c) That the earliest adequately defined name for a stratigraphic unit is to have priority providing that it does not displace a well established name for the same unit. Existing names are to be retained where possible.

(d) That the establishing of a new formal litho-stratigraphic unit requires publication in some recognized scientific medium of an adequate definition which includes:

- (1) Statement of intention to designate a formal unit.
- (2) Selection of a name.
- (3) Definition of the unit in the type area with specific location and description of type section.
- (4) Distinguishing characteristics including dominant lithologies.
- (5) Definition of boundaries and contact relationships.
- (6) Thickness in type area (where possible).
- (7) Geologic age and correlation (where possible).

(e) That the establishing of a new formal time-stratigraphic unit requires publication in some recognized scientific medium of an adequate definition which includes:

- (1) Statement of intention to designate a formal unit.
- (2) Selection of a name.
- (3) Definition of the boundaries of the unit.
- (4) Selection of a type section (for Stages and Substages).
- (5) Distinguishing characteristics, e.g. key fossils, if paleontologically defined.
- (6) Correlation and age relationships.

(f) That the Committee of the Geological Society of N.Z. consider recommendations made to it by groups of geologists from time to time for changes or additions to any code which the Society may adopt.

RESULTS OF THE QUESTIONNAIRE ON STRATIGRAPHIC
NOMENCLATURE

The questionnaire distributed with the July (1964) issue of the Geological Society's Newsletter to approximately 300 members and others (many of whom are not practising geologists) met with a good response from geologists and students. Sixty-six replies were received in time for consideration by the Sub-committee from the following: N.Z. Geological Survey: 33; University Staff: 12, Students: 7, Others including overseas members: 14. Although a reply within one month was requested, initial response was slow and replies were still being received in November. Since two-thirds of New Zealand geologists replied, the results appear to be a fair cross section of opinion.

As was to be expected, problems arose in assessing the replies. Many were not yes or no and often had to be translated into qualified yes or qualified no. Most sections were assessed independently by two different members of the sub-committee so as to prevent significant discrepancies in interpretation of the replies but overall uniformity in presentation of the analysis was difficult to achieve.

Lithostratigraphic classification did not prove contentious either in principles or in nomenclature but the answers to the sections on Time stratigraphy and Biostratigraphy indicated considerable controversy about basic principles of classification. Even in this area, however, the answers indicated greater harmony of opinion on some questions such as type sections than had been expected. Detailed comment on the classification of volcanic ash showers suggested that they posed particular problems which may need special and separate consideration.

The additional comments ranged over a wide variety of opinion, much of which was essentially an amplification of answers already given. The two comments which seem to have particular relevance were: (1) As an attempt to clarify and standardise the use of terms, codes can make it easy for writers to appear to make precise what is imprecise. What is essential is that the facts should be clear. More hard thought is needed on stratigraphic objectives. (2) It is essential to distinguish the mandatory aspects, e.g. priority and designation of type section, adequate description, from the non-mandatory area of stratigraphic classification.

The subcommittee thanks all of those who replied and especially those who contributed thoughtful and constructive comment.

A. LITHOSTRATIGRAPHIC UNITS

- A (1) The proposed International Code (1961), referred to hereafter as I.C., states: A lithostratigraphic unit is a body of rock strata which is unified with respect to adjacent strata by consisting dominantly of a certain lithologic type or combination of lithologic types or by possessing other impressive and unifying lithologic features. Do you agree with this meaning?

Answers: Yes or virtually yes: 51
No comment: 9

Comment: Mostly criticism of wording: "strata" should be deleted (2); "adjacent" needs elaboration (2). Fossil content could be a distinguishing feature. Boundaries need not be dis- or unconformable. Heterogeneity could be a unifying feature.

Result: The majority indicated acceptance of the I.C. definition of lithostratigraphic unit but comment suggested some modification of the wording.

- A (2) The I.C. adopts the following classification:

Group (a formal unit for an assemblage of two or more contiguous associated formations).

Formation (a formal unit for a body of rock strata of intermediate rank, unified with respect to adjacent strata by consisting dominantly of a certain lithological type or combination of lithological types or by possessing other impressive and unifying lithological features. The thickness of units of formation rank follows no standard and may range from a few metres to several thousand).

Member (a formal lithostratigraphic unit next in rank below a formation and is a part of a formation which it has become useful to recognise as a named entity within the formation because it possesses lithologic characters distinguishing it from adjacent portions of the formation).

Bed (a unit layer in a stratified sequence of rocks which is visually or physically more or less distinctly separable from other layers above and below. A distinctive bed may be given a proper name and may constitute a formal unit).

Lithostratigraphic zone (an informal lithostratigraphic unit to indicate a body of strata unified in a general way by lithologic features but for which there is insufficient need for a formally named unit).

Q: In what way, if any, do you disagree with this classification?

Answers: No general disagreement except for lithostratigraphic zone. 27 condemned it outright; 1 expressed full agreement; 29 made no comment which may imply agreement. Answers of those (re lithostratigraphic zone) who have published results of post-degree mapping in N.Z. were: Applaud (1); No comment (7); Condemn (16).

Comments: Group: constituent formations should be of a common depositional environment, i.e. natural associations (2).

Formation: Many stressed inclusion of "mappable" in definition; widely varying answers as to allowable thickness; should lack internal unconformities; age can change in different areas; introductory statement should include precise acceptable limits of lithological variation.

Member: Very few comments.

Bed: (1) Lens and tongue useful synonyms of bed (2); should be informal (4 definitely, many others implied).

Result: The majority accept the I.C. lithostratigraphic classification except for lithostratigraphic zone. Many stressed that "mappable" should be included in the definition of Formation and considered that the I.C. lower limit of a few metres was too thin.

A (3) The I.C. allows for the use of subgroup and supergroup. Do you consider that Group and Supergroup should apply to laterally contiguous or vertically contiguous units or both?

Answers: Both vertically and laterally contiguous....(32); vertically only....(14); laterally only.....(1); both for

Supergroups but vertically only for Groups.....(2); laterally for Supergroups but vertically for Groups.....(1). The balance of votes was: (both : vertically) oil companies 1:1, University staff 6:3, N.Z.G.S. Lower Hutt 8:5, N.Z.G.S. districts 10:2, Others 7:2.

Result: The majority considers that Supergroup and Group should apply to both vertically and laterally contiguous units.

A (4)The I.C. states that both a formation and a formally named bed should be based on a specifically designated and delimited type section or reference sections. Do you agree with this method of defining a formation?

Answers: Yes 38
Yes qualified 19
No 3

Comment: Writers should not be tied (1); prefer a number of standard sections to a type (1); No type or standard sections (1); Type subsequently changeable (4); sometimes impracticable in Antarctica (1); substitute type area (1); type section specifically designated but not delimited (1).

Result: A large majority agree with the principle of a type section but many favour additional standard sections.

A (5)The I.C. states that the name of a group should be derived from an appropriate geographic feature near the type areas of its component formations. Do you agree that a group should be named in this way?

Answers: Yes 38
Yes qualified 16
Not necessarily 4
No 1

Comment: Lithology could be added (e.g. Tuhua Plutonic Group).

Results: A large majority considers that a group should be named from a geographic feature.

A (6)The I.C. states that the name of a formation should be derived from an appropriate geographic feature in the type area combined, where feasible, with the dominant rock type of which it is composed, e.g. Amuri Limestone

Formation. Do you agree that a formation should be named in this way? (but see A8).

Answers: Yes 26
 Qualified yes .. 24
 Yes, if possible .. 10
 No 3

Comment: Delete "formation" (17); delete lithology (5); (see also A8).

Result: Most agree that a formation should be named from a geographic feature but opinion on the inclusion of "formation" and lithology is varied.

A (7) The I.C. states that the name of a bed should be derived from a geographic locality at its type section combined with the name of the rock type, e.g. Gardner Limestone Bed. Do you agree that a bed should be named in this way? (but see A8).

Answers: Yes 27
 Yes qualified .. 19
 No 10

Comments: Add lithology and omit "bed" (6); (see also A8).

Result: A majority prefers that bed should be named from a geographic feature but opinion is divided on the form of the name.

A (8) Do you think that non-geographic names such as Putty Ash, Cannon-ball Sandstone, Benson Greensand and Coral Rag are acceptable for formation, member or bed names?

- (a) in any circumstances?
- (b) in areas with insufficient geographic names?

Answers: Yes in any circumstances 16
 Yes in areas with insufficient geographic names .. 22
 Yes but only proper names 2
 Yes but only for members or beds 5
 No 18
 No for new names but do not change old ones .. 4

Result: A majority considers it acceptable to use other than geographic names for formations members and beds but most specify "in areas with insufficient geographic names".

A (9) Igneous and Metamorphic Rocks (not dealt with by the I.C.). The Australian Code (1959) states "Igneous and Metamorphic Rocks should be classified and named according to the same principles as sedimentary rocks as far as stratigraphical methods can be applied to their study". Do you agree with this principle?

Answers: Yes 49
No 2

Comments: Type area more suitable than section (1).

Result: A large majority agrees with the principle that Igneous and Metamorphic rocks should be classified and named according to the same principles as for sedimentary rocks as far as is possible.

B. BIOSTRATIGRAPHIC TERMS

(Where the answers of the Paleontologists seem particularly relevant they are given in brackets beside the total.)

B (1) Do you consider that chrono- and biostratigraphy are different?

Answers: Yes 46 (16)
Yes qualified 8
No 4 (1)
No comment .. 8 (1)

Comments: 4 emphasised "ideally".

Result: A large majority of geologists and paleontologists consider that chrono- and biostratigraphy are different.

B (2) Do you approve of the separation of chrono- and biostratigraphic classification?

Answers: Yes 44 (15)
Yes qualified 6
Probably .. 1
No 4 (1)
No comment .. 10 (2)
Doubtful .. 1

Result: A large majority of geologists and paleontologists

approve of the separation of chrono- and biostratigraphic classification.

B (3) The I.C. states: A biostratigraphic unit is a body of rock strata which is unified with respect to adjacent strata by certain elements of its fossil content. Do you accept this definition?

Answers: Yes 48 (14)
 Yes qualified 4 (3)
 Probably .. 1
 No .. 3
 No comment .. 10 (1)

Comments: Some criticism of wording, particularly of "with respect to adjacent strata".

Results: General agreement on the I.C. definition of biostratigraphic unit but criticism of wording.

B (4) The I.C. states: A formal biostratigraphic zone is a body of strata characterised by the occurrence of a taxonomic form or forms from one or more of which it received its name, e.g. Cassidulina laevigata Zone. Do you accept this definition?

Answers: Yes 41 (13)
 Yes qualified 3
 Uncertain .. 2
 No .. 7 (4)
 No comment .. 13 (1)

Comments: Varied criticism of definition e.g. need more emphasis on faunal change; yes if occurrence means actual presence; occurrence should mean total range.

Result: Although most expressed unqualified agreement with I.C. definition of formal biostratigraphic zone many see a need for a clearer definition.

B (5) The I.C. states: The term zone, without a prefix or modifier, is useful only in a general sense in biostratigraphic terminology as it does not allow differentiation between the concepts of assemblage and range. Do you accept this use of zone?

Answers: Yes 31 (13)
 Yes qualified 4 (1)
 Uncertain .. 1
 No 9 (2)
 No comment .. 21 (2)

Comments: "Too indefinite"; "Avoid zone unless qualified";
 "Zone becomes virtually useless".

Result: Most geologists and paleontologists accept this I.C. definition of zone but a minority consider it should have a more restricted meaning.

B (6) It is implicit in the I.C., and explicitly stated in the American Code, that zones can be of any magnitude. Do you accept this principle? (Note: as originally used by Oppell and later by Arkell in "Jurassic Stratigraphy of the World", a zone was a subdivision of a stage.)

Answers: Yes 34 (14)
 Yes qualified 3 (1)
 Uncertain .. 1
 No 12 (2)
 No comment .. 16 (1)

Comments: 1 advocates zonal heirarchy; several say desirable to be as small as possible. "Zone is a subdivision of a Stage" (6, including 1 paleontologist). *

Result: Most geologists and paleontologists accept that zones can be of any magnitude but about a quarter of those who answered, disagreed.

B (7) The I.C. adopts the following terminology:

- (a) Assemblage-zone or cenozone: A formal unit for a body of strata characterised by a certain natural assemblage or association of fossil forms. It should be named from prominent constituents of the assemblage (e.g. Eponides - Planorbulinella Assemblage-zone) and should be based on a specifically designated and delimited type section or reference sections. The extent of the assemblage zone coincides with the extent in reasonable continuity of known occurrences of the particular assemblage.

Do you agree with the concept and nomenclature adopted by the I.C. and the requirement of a type

or standard reference section?

Answers: Yes 26 (9)
 Yes qualified 14 (6)
 No 8
 No comment .. 15

Comments: 11 object to type or reference section; 2 wanted several reference sections; 28 favour type section; 1 objects to formal nomenclature; "stricter definition needed".

Result: Although the majority indicated unqualified agreement with the I.C. definition of Assemblage-zone, many wanted a stricter definition and many objected to a type section.

(b) Range-zone or scrozone. The I.C. defined this as follows:

A formal unit for a body of strata representing the total range of occurrence of specimens of some one particular species, genus, or other taxon, named from the fossil form by whose range the limits of the zone are defined, e.g. Didymograptus Range-zone, and therefore its principal standards of reference are the type specimen, reference specimens, or biologic concept of this particular fossil form. The extent of the zone is controlled by the extent of the known occurrences of the fossil form concerned.

Do you agree with the I.C. concept and terminology of this type of zone? Would you prefer Biozone?

Answers: Yes - Range Zone 24 (11)
 Yes - Acrozone 1
 Yes qualified 6 (2)
 Biozone 15 (4)
 No 4 (1)
 No comment 15

Comments: "Disagree with concept: type section absurd: prefer biochron as time measure. Total range an abstraction. No need for different brands of zones. Dislike formalization."

Results: Although a majority of geologists and paleontologists indicated unqualified agreement with the I.C. definition of range-zone and prefer the name range-zone to biozone, the numbers of those who disagree with both the concept and nomenclature are such that there cannot be said to be any

general agreement.

- (c) Epibole (Acme-zone, peak-zone). The I.C. defines this as a body of strata representing the maximum development of some species, genus or other taxon (but not necessarily its total range). It takes its name from the taxon whose zone of maximum development it delimits, e.g. Didymograptus Acme-zone.

Do you agree with the I.C. definition of these terms? Which, if any, do you prefer?

<u>Answers:</u>	Total approval	..	..	37	
	General approval..	..	..	4	(1)
	Epibole	..	..	2	
	Acme-zone..	..	..	12	(5)
	Peak-zone..	..	..	16	(6)
	Yes qualified	..	..	3	(2)
	No	..	..	11	(3)
	No comment	..	..	21	(1)

Comments: 11 said too vague or of doubtful use.

Result: The answers are difficult to summarise. The majority of those who answered agree with the I.C. definition and most prefer Peak-Zone or Acme-Zone. Many, however, consider the concept too vague and of little use.

- B (8) The American Code has adopted Concurrent-Range-zone for the overlap in range of two or more taxa. Do you approve of this term?

<u>Answers:</u>	Yes	..	..	18	(7)
	Yes qualified	..	..	8	(5)
	No	..	..	17	(4)
	No comment	..	..	23	(2)

Comments: Why formalise? Glumsy, prefer overlap (range) zone; a form of assemblage-zone.

Result: Those who answered were about equally divided over the need for the term "Concurrent-Range-zone". Overlap-zone was a suggested alternative.

- B (9) The German term Teilzone is available for the observed local range of a fossil taxon (as distinct from its total range). Do you accept this term? If not, what

substitute would you prefer?

Answers: Yes 25 (9)
 Yes qualified 2 (1)
 No 20 (6)
 No comment .. 19 (1)

Comments: Most of the No's prefer "local range-zone"; "meaning uncertain, requires clearer definition of local".

Result: Answers are about equally divided in their preference for Teilzone or Local Range-Zone, with a small bias towards Teilzone.

C. CHRONOSTRATIGRAPHIC TERMS

C (1) The I.C. adopted the following classification:

1st Order Erathem
 2nd Order System
 3rd Order Series
 4th Order Stage
 5th Order Substage

Do you accept this classification? If not what alternative classification would you prefer?

Answers: Yes 35
 Yes qualified 19
 No 3
 No comment .. 9

Comments: 17 said yes but dislike Erathem; No's don't agree to separate from Time Terms.

Result: A large majority accepts the I.C. classification of chronostratigraphic terms with the exception of Erathem.

C (2) The I.C. defines a stage as follows: A body of rock strata of intermediate rank... which is unified by representing the rocks formed during a specific interval of geological time. It is the basic working unit of chronostratigraphic classification. Do you accept this definition?

Answers: Yes 39 (15)
Yes qualified 13
Probably .. 1
No 5 (3)
No comment .. 8

Comments: Some No's say stage is essentially biostratigraphic composed of and bounded by zones. Order of time should be included in definition. What is testable is order of appearance and disappearance of defining criteria - not that any particular unit or boundary surface was deposited at a particular time. Also a situation where it is bounded by unconformities and represents an event or period between two events.

Result: Although most geologists and paleontologists indicated unqualified acceptance of the I.C. definition of stage, an articulate minority objects to both the concept and definition.

G (3) The I.C. states: A stage should be based on a specifically designated and delimited type section or reference sections. Do you accept this principle?

Answers: Yes 32 (15)
Yes qualified 12 (2)
Probably .. 1
No 12 (1)
No comment .. 9

Comments: Variety of opinion: Several prefer several reference sections to a type. A few want provision for changes. One says systems of homotaxial units do not depend on types or reference sections. Several object to principle of type sections others insist on types but do not accept delimitation as one of their functions. Two advocate primary type sections and secondary standard sections.

Result: The majority accept the principle of basing a stage on a type section but many stress the value of additional reference or standard sections. The term "reference sections" is too indefinite.

G (4) The I.C. stated: The boundaries of a stage as they are extended away from the type section are by definition surfaces of equal time value everywhere (isochronous surfaces). Do you agree with this statement?

Answers: Yes 25 (9)
Yes qualified 26 (6)
Uncertain .. 1
No 7 (3)

Result: A large majority indicated either unqualified agreement or expressed qualified - agreement, with the statement as the ideal or theoretical aim of defining stage boundaries.

C (5) I.C. states: The name of a stage should preferably be derived from a geographic feature in the vicinity of its type area. Do you accept this recommendation?

Answers: Yes 43
Yes qualified 6
Probably .. 1
No 4
No comment .. 11

Comments: A few say "if possible"; One who disagrees with type locality substitutes "where well exposed"; Another says "name from a section where it is known to be in succession with the preceding stage".

Result: A large majority favours naming a stage from a geographic feature.

C (6) The I.C. notes that many established stages have "-an" endings but that terms such as Claiborne Stage are acceptable. Do you consider that stage names should always have "-an" endings or not?

Answers: Yes 32
Yes qualified 8
No 16
No comment .. 10

Comments: Main comment: "preferable where possible but not to change existing names".

Result: Most consider that stages should have "-an" endings.

C (7) The I.C. does not insist upon "-an" endings for Series. Do you consider that Series names should have "-an" endings?

Answers: Yes 8
 Yes qualified 3
 No 42
 Uncertain .. 1
 No comment .. 12

Comments: Reasons given in favour: Consistency with stages; distinction from lithostratigraphic terms.

Result: A large majority considers that Series should not have "-an" endings.

C (8) Substage: The I.C. states that the substage is subject to the same rules of nomenclature and of definition by reference to a type section as is a stage. Do you agree or disagree with this principle?

Answers: Yes 45 (16)
 Yes qualified 5 (1)
 No 6 (1)
 No comment .. 9

Comments: Some object to type section. Others think type and reference sections important.

Result: A large majority considers that substage should be subject to the same rules of nomenclature and definition as a stage.

C (9) The I.C. notes that some stages are completely divided into formally named substages; others may have only certain parts divided into formally named substages. Do you think the latter situation is acceptable?

Answers: Yes 29 (4)
 Yes qualified 4 (1)
 Uncertain .. 1
 No 18 (10)
 No comment .. 14 (3)

Comments: Yes, "Similar to member in a formation". No, "One good subdivision automatically creates an adjacent one".

Result: Although a majority considers it allowable for a stage to have only certain parts divided into formally named substages, there is no general unanimity.

C(10) The I.C. has adopted the term chronostratigraphic zone or chronozone as an informal unit to indicate the body of strata representing the rocks formed during any minor interval of geologic time, e.g. the chronozone of Globotruncana is the body of strata of the same age as the time-span representing all the known occurrences of Globotruncana; the chronozone of detrital garnet occurrences in the El Mene Formation is the body of strata of the same age as that part of the El Mene Formation in which detrital garnet is found.
Do you think chronozone is a useful term?

Answers: Yes 18 (3)
Yes qualified .. 5
Perhaps .. 1 (1)
No 32 (13)
No comment .. 10 (1)

Comments: 2 said yes but not for biostratigraphic zones. 1 said "use bed in loose sense".

Result: The majority of geologists and particularly paleontologists do not regard chronozone as a useful term.

UNITS OF GEOLOGICAL TIME

The I.C. recommends the following time terms:

1st Order	ERA	corresponding to	ERATHEM
2nd Order	PERIOD		SYSTEM
3rd Order	EPOCH		SERIES
4th Order	AGE		STAGE
5th Order	(Time)		SUBSTAGE

It is proposed to use the term time for the geological time corresponding to any chronostratigraphic unit of lesser rank than a stage.

Do you accept this classification? If not what alternative classification would you prefer?

Answers: Yes 38
Yes qualified .. 17
Probably .. 1
No 2
No comment .. 8

Comments: Of qualified yes, 14 object to restricted use of time, 7 of whom prefer subage. Two consider no need for

separate time terms corresponding to time stratigraphic terms.

Result: A large majority accept the I.C. classification of time terms but many object to the use of "time" as an equivalent for substage and would prefer "subage".

E. GENERAL QUESTIONS

E (1) Do you think New Zealand geologists should attempt to standardise their methods and principles of stratigraphical classification? (see E(4)).

<u>Answers:</u>	Overseas N.Z. Students University.	G.S.	Total
	and others		
Yes	8 (1)	7	8 (2) 29(4) 52
No	3	2	4 11

Comments: Yes qualified in brackets, some agree to principles, others to methods.

Result: A considerable majority is in favour of attempting standardisation.

E (2) If your answer to E(1) is YES, do you favour (a) a formal code of rules or (b) a set of recommendations for procedure in stratigraphical classification?

Answers:
 (a) Formal Code of rules...11 (University staff: 6; G.S. 5)
 (b) Recommendations.....38 (University staff: 1; G.S. 21)

Result: The total indicates a large majority opinion against a formal code of rules but a division of opinion between University geologists and others is evident in the breakdown of the figures. See also E(5).

E (3) If you prefer a formal code, which of the following do you favour? (i) The I.C. (1961) as it stands; (ii) the American Code (1961) as it stands; (iii) the Australian Code (1959) as it stands; (iv) one of these modified; (v) a fresh N.Z. code?

<u>Answers:</u>	(1)	I.C. ..	..	..	..	2
	(ii)	American ..	..	..	..	0
	(iii)	Australian ..	..	..	..	0
	(iv)	One modified ..	..	..	..	6
		American modified ..	..	..	..	9
		I.C. modified..	..	..	..	6
		I.C. or American modified ..	..	..	..	2
	(v)	Fresh N.Z. code ..	..	..	..	7
		Against a N.Z. code ..	..	..	..	1

Result: Only about half answered, of whom a small majority favour the I.C. or American codes modified. Note figures for Australian code in E(11).

E (4) If your answer to E(1) is NO, do you think that N.Z. geologists should standardise the meanings of their stratigraphical terms?

<u>Answers:</u>	Overseas	N.Z. Students and others	University Staff	G.S.	Total
No	-	-	2	1 or 2	4
Yes	5	2	2	9	18

Comments: "It could not be done".

Result: A considerable majority favour standardisation.

E (5) If a set of stratigraphical principles and/or definitions of terms is adopted, do you wish to see it made mandatory for all N.Z. geologists?

<u>Answers:</u>	Overseas	N.Z. Students and others	University Staff	G.S.	Total
No	6	3	8	27	44
Yes	6	5	3	7	21

Total of N.Z. geologists for and against - 15:38.

Result: Most N.Z. geologists object to mandatory codes.

E (6) If your answer to E(5) is YES, how would you suggest they be enforced?

- (a) By a permanent stratigraphic committee?
- (b) By editors in N.Z. journals?
- (c) By general weight of opinion of geologists?

<u>Answers:</u>	Overseas	N.Z.Students and others	University Staff	G.S.	Total
(a)	1	4	1	5	11
(b)	4	4	1	5	14
(c)	4	4	1	7	16

Comment: "by the police" (1).

Result: Opinion is about equally divided but those favouring committee control are a more distinct minority.

E (7) If a non-obligatory code is adopted, do you consider that authors departing from the recommendations should be required to state in their publications how and why they have not complied?

<u>Answers:</u>	Overseas	N.Z.Students and others	University Staff	G.S.	Total
No	-	2	3	5	10
Yes	9	4	4	26	43
Yes (qualified)	6	1	2		9

Comment: "How but not why" (4).

Result: A large majority consider that authors should be requested to state how they departed from a non-obligatory code, if adopted.

E (8) Priority of names: Should there be a rule to protect existing names? (rule of priority)

<u>Answer:</u>	Overseas	N.Z.Students and others	University Staff	G.S.	Total
No	2	1	4	6	13
Yes	9	4	3	9	25
Yes qualified	2	3	3	17	25

Comments: Answers to this question were difficult to translate into yes or no. Eight specified "if they had been adequately defined", others "if not too rigid".

Result: General qualified approval.

E (9) If you object to a rule of priority because of difficulties with poorly defined old names, would you accept a priority rule covering all names proposed or confirmed after a certain date - say all names proposed after the date of publication of the Lexicon?

<u>Answers:</u>	Overseas	N.Z.Students and others	University Staff	G.S.	Total
No	2	1	5	8	16
Yes	2	3	4	9	18
Yes qualified	1			5	6
No comment	8	5	1	8	22

Comment: "Yes, provided definition adequate" (6).

Result: Majority is cautious about accepting such a rule.

E(10) Duplication of names: Do you object to rock units and stages or series having the same names?

<u>Answers:</u>	Overseas	N.Z.Students and others	University Staff	G.S.	Total
No	3	1	5	5	14
Yes	9	5	5	29	48

Result: A large majority object to duplication of rock and stage names.

E(11) What stratigraphic code, if any, are you using at present?

<u>Answers:</u>	Overseas	N.Z.Students and others	University Staff	G.S.	Total
I.C.	1	1	2	2	6
American	3	2	2	10	17
Australian	2	1	3	5	11
None	2	-	3	-	5
No comment	4	2	-	2	8
Am. + Aust.	-	1	-	4	5
Several				3	3
I.C. + Amer.lithostratigraphic				1	1
Own Code				4	4

Note discrepancies in answers to E(3).

Result: About half N.Z. geologists refer to existing stratigraphic codes. More use the American Code than any other.